

Pamphlet No. 15

A KNIFE FOR HARVESTING CACAO
AND
A SMALL DRIER FOR CACAO BEANS



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CENTRAL PLANTATION CROPS RESEARCH INSTITUTE

KASARAGOD 670 124

KERALA, INDIA

1980

1. A KNIFE FOR HARVESTING CACAO

Cacao pods are borne on soft cushions on the main trunk and branches of cacao trees. Cushions are specialised structures found on stems, and flowers are produced there. If cushions are damaged in any manner, production of flowers on them is adversely affected in the subsequent years. Normally a knife or sickle is used for harvesting the cacao pods. While the pods borne up to a height of about 2 m on the stems are harvested easily, those which are above this height are harvested by climbing the trees or by using a step ladder. Sometimes, small sickles tied to a bamboo pole are used for harvesting. All these methods of harvesting pods often damage the cushions.

Less often pods are harvested by twisting them with hand. This method eliminates the use of any tool and cushions are only rarely damaged, but it is time consuming.

The tool described here (Fig. 1.1) has been developed to harvest cacao pods which are borne at more than 2 m height. This eliminates the use of a ladder for climbing the tree. The tool can also perform the function of a sickle or knife used for harvesting pods which are at the lower branches and main stem. The tool comprises a cutting blade and a long handle. The blade is made of 3 mm thick spring steel sheet. The handle is an aluminium tube 2.5 m long, 15 mm diameter. The blade is fastened to the handle at one end by means of two 6 mm × 12 mm full-threaded bolts and nuts which facilitate easy replacement of the worn-out blade. A sharp edge and suitable shape of the blade help in smooth and easy harvesting of cacao pods. Total weight of the tool is about 500 gm. The cost of this tool works out to approximately Rs. 20/- and cost of blade alone for replacement to be about Rs. 3/-.

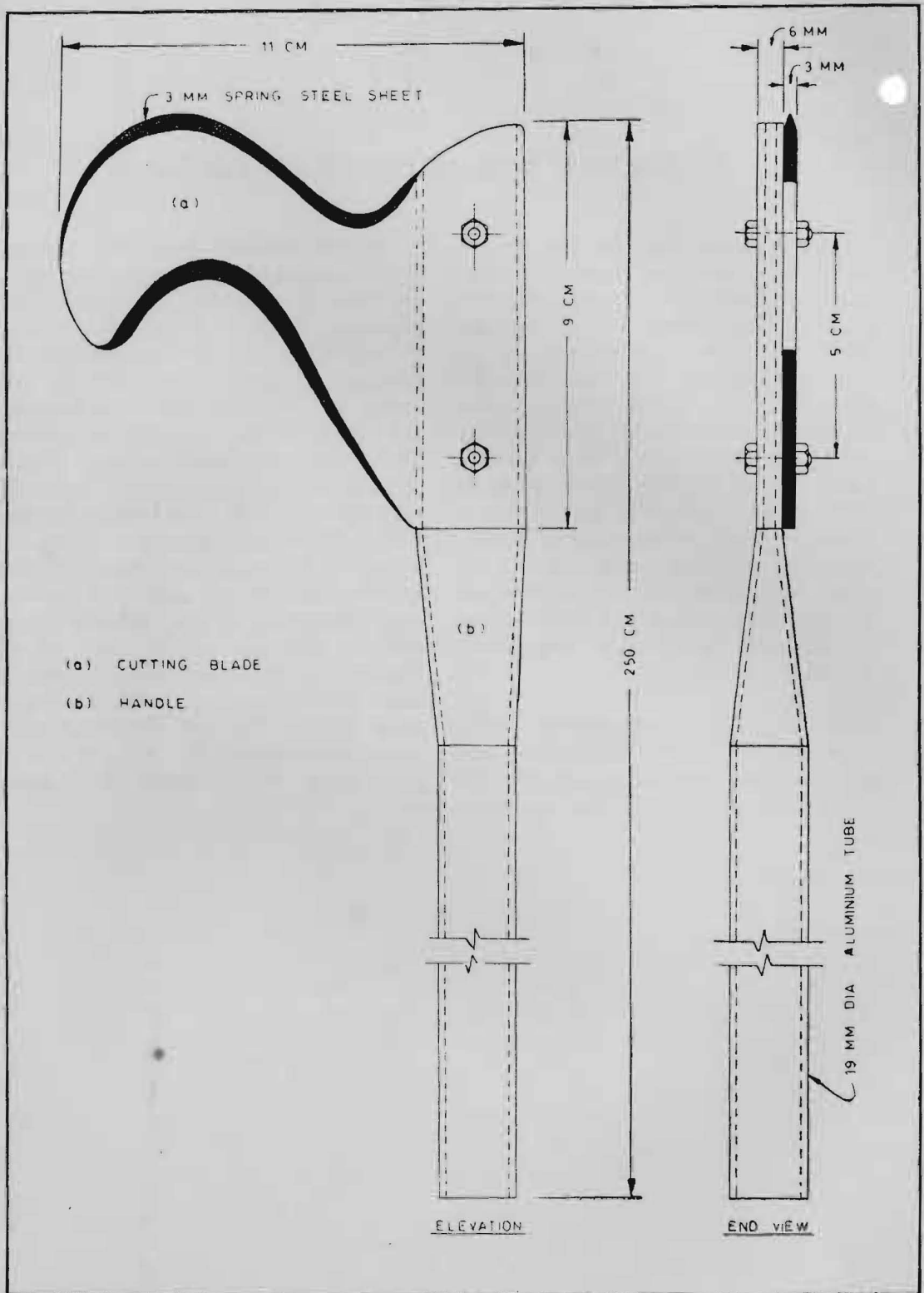


Fig. 1.1. Cacao pod harvesting knife

2. A SMALL DRIER FOR CACAO BEANS

Introduction

In India cacao is mainly grown on small holdings as a mixed crop in coconut and arecanut gardens. Small quantities of fresh beans are obtained by the growers in a single harvest. The peak harvest coincides with monsoon months. The beans after fermentation cannot be kept for long without drying as these are likely to get infected by fungi which adversely affects the flavour and quality of beans. As sundrying is not possible during the monsoon months, there is need for artificial drying of beans at a temperature not exceeding 60°C (bean temperature). A suitable drier developed for this purpose at this Institute, is described below.

The Drier

The drier consists mainly of a heat source, plenum chamber, drying chamber and exhaust air chamber (Figs. 2.1 & 2.2). Materials used for construction are hard-wood, GI sheet, aluminium sheet, aluminium angle and a 500 W industrial air heater/kerosene wick stove/biogas burner. As small quantities of beans are handled and slow drying is preferable to prevent beans from becoming acidic, no blower is fixed in the drier. Since cacao bean mucilage causes quick corrosion in iron based materials, aluminium sheet trays are preferred. The wooden structure serves the purpose of insulation also. A carpenter with ordinary tools can easily fabricate it. A detailed engineering drawing of the drier is given in Fig. 2.3.

Operation

At a time upto 40 kg of fermented beans can be handled in this drier. The beans can be loaded in all the six trays in approximately equal quantities. After loading the beans in each tray a line of perforations in the centre of each tray is kept open. This helps in better air circulation. After loading the beans, the trays should be placed in the drying chamber as shown in Fig. 2.4 to facilitate uniform drying.

When electric heater is used as heating source there is no need for any temperature control as the 500 W heater is found to be incapable of raising the temperature of drying air more than 75°C in the drier. The temperature inside the drier can partially be regulated by opening/closing the outlet. In the case of kerosene wick stove/biogas burner the temperature can be regulated by adjusting the flame. A thermometer is provided in the drier to record the drying air temperature.

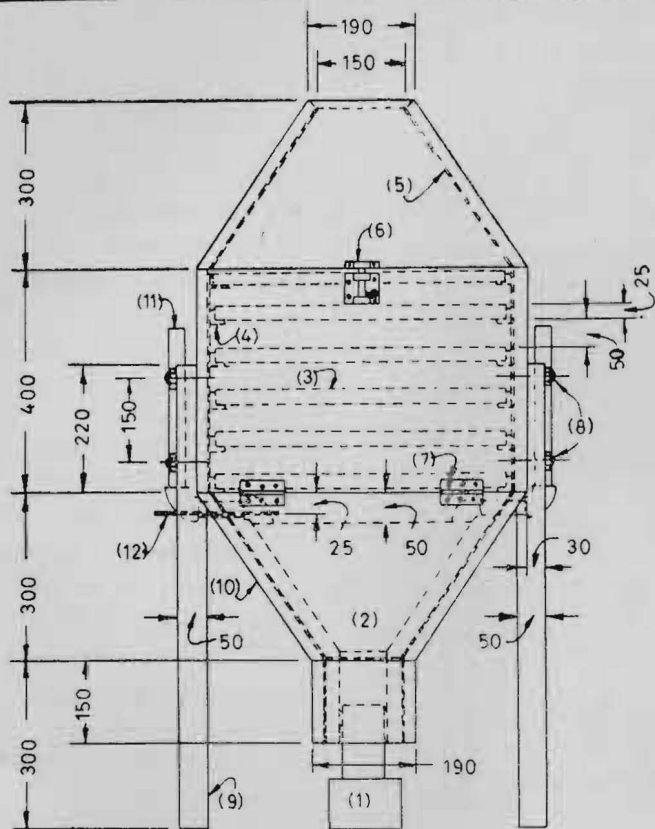
At every 8 hours interval after the start of the drying operation, the heat source can be put off for about 15 minutes and the position of trays changed as shown in Table 2.1. While changing the tray position, the beans in each tray should be raked with hand to avoid their sticking to each other and also for achieving better uniformity in drying. If only a limited quantity (say upto 15 kg) are to be dried the interval of changing the tray positions should be from 5 to 6 hours.

The stage of completion of drying can be judged by the characteristic sound produced when a sample of beans is taken in hand. Also when a dried bean is squeezed between the fingers it should not bend or shatter but should break. The completion of drying should be checked in all the trays. 30 kg beans can be dried in about 48 hours and 40 kg in about 65 hours. The beans after drying should be allowed to cool down in the drier itself for about 2 hours and then stored safely.

Table 2.1. Schedule of changing tray positions at different intervals

At the start	After					
	8 hrs	16 hrs	24 hrs	32 hrs	40 hrs	48 hrs
1	6	1	3	4	5	2
2	5	6	1	3	4	5
3	4	5	6	1	3	4
4	3	2	5	6	1	3
5	2	4	2	2	6	1
6	1	3	4	5	2	6

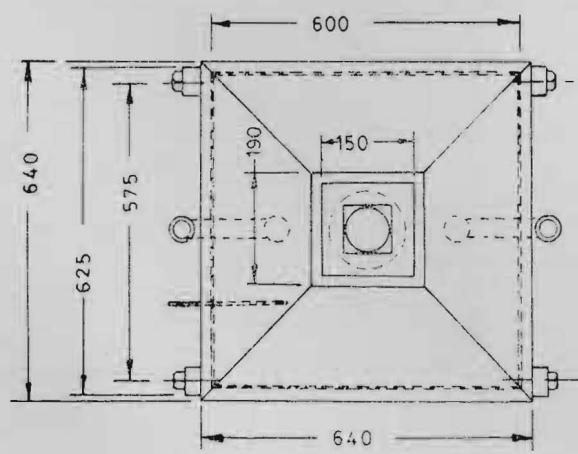
Numbers indicate the tray number and its position in vertical order from top to bottom in the drier.



Elevation

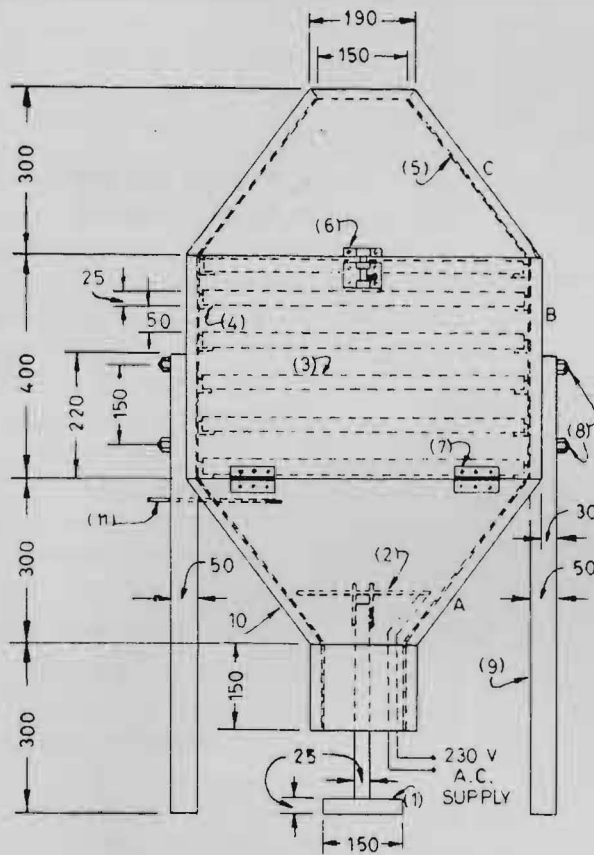
- A PLENUM CHAMBER
- B DRYING CHAMBER
- C EXHAUST AIR CHAMBER
- 1 HEAT SOURCE (WICK STOVE / GAS BURNER)
- 2 HEAT EXCHANGER
- 3 PERFORATED AL. TRAYS (600 x 560 x 25)
- 4 AL. ANGLE 25 x 25
- 5 G.I. SHEET LINING 26 GAUGE
- 6 TOWER BOLT 75 MM
- 7 HINGE 75 MM
- 8 10 x 90 BOLTS WITH NUTS
- 9 50 x 50 WOODEN LEG
- 10 20 THICK BENTEAK / JACKWOOD CHAMBER
- 11 SMOKE OUTLET (G.I. PIPE 33 MM)
- 12 THERMOMETER

ALL DIMENSIONS ARE IN MM



Plan

Fig. 2.1. Cacao bean drier (Wick stove/Gas burner operated)

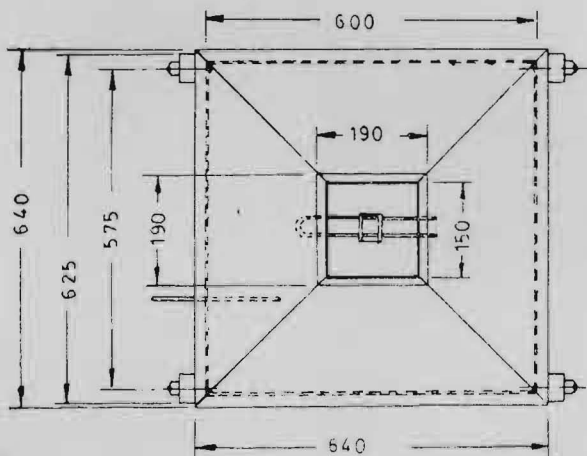


A. PLENUM CHAMBER
 B. DRYING CHAMBER
 C. EXHAUST AIR CHAMBER

- 1 HEATER STAND
- 2 HEATER (500 W)
- 3 PERFORATED AL. TRAYS (600 x 560 x 25)
- 4 AL. ANGLE (25 x 25)
- 5 G.I. LINING SHEET 26 GAUGE
- 6 TOWER BOLT 75 MM
- 7 HINGE 75 MM
- 8 10 x 90 BOLTS WITH NUTS
- 9 50 x 50 WOODEN LEGS
- 10 20 THICK BENTEAK / JACKWOOD CHAMBER
- 11 THERMOMETER

Elevation

ALL DIMENSIONS ARE IN MM



Plan

Fig. 2.2. Cocoa bean drier (Electrically heated)

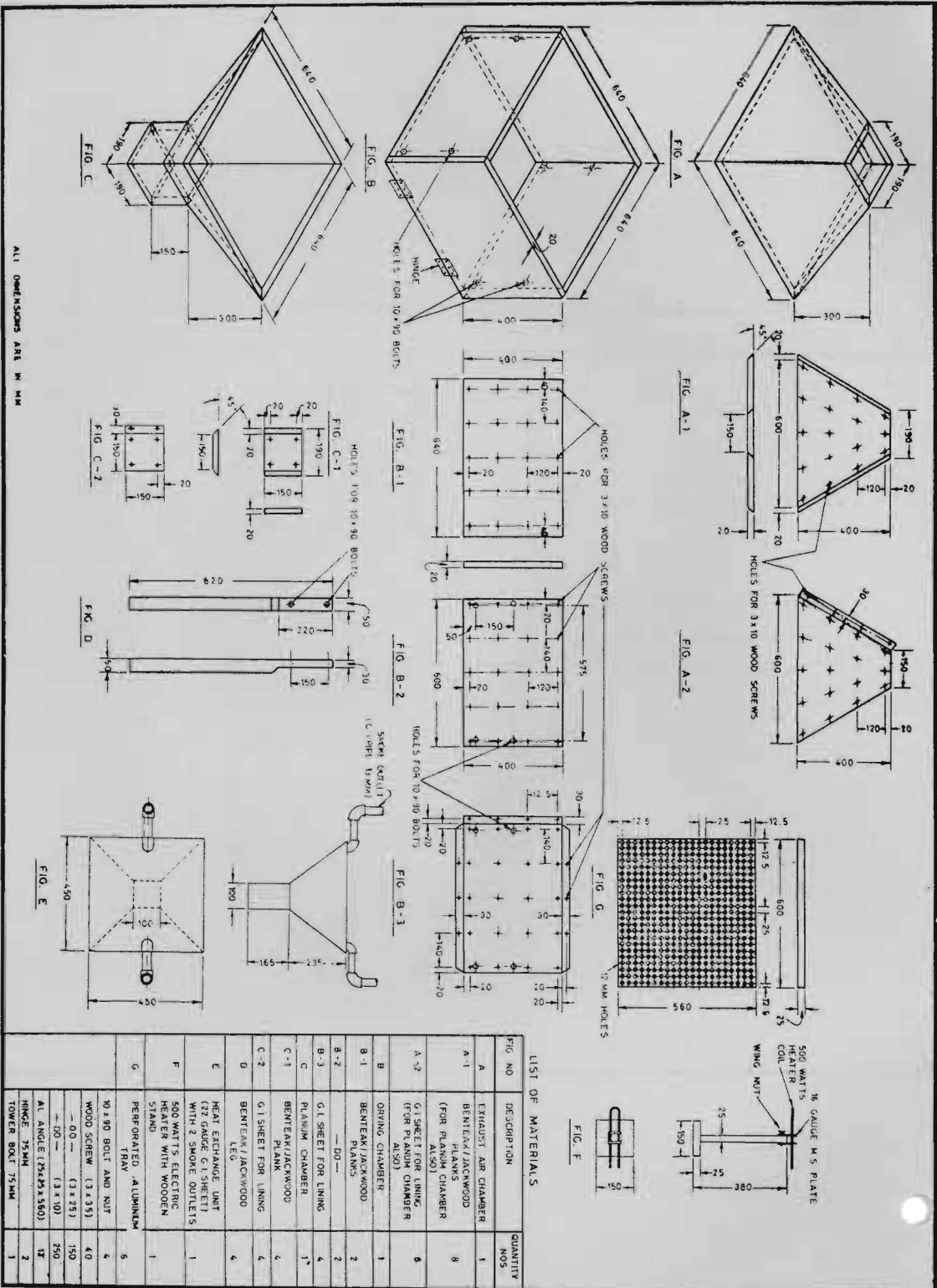


Fig. 2.3. Detailed drawing of cacao bean drier

LIST OF MATERIALS

FIG NO	DESCRIPTION	QUANTITY NOS
A	EXHAUST AIR CHAMBER	1
A-1	BENTONITE/JACKWOOD PLANS (FOR PLANUM CHAMBER)	8
A-2	G.I. SHEET FOR LINING (FOR PLANUM CHAMBER ALSO)	6
B	DRIVING CHAMBER	1
B-1	BENTONITE/JACKWOOD PLANS	2
B-2	G.I. SHEET FOR LINING	2
B-3	G.I. SHEET FOR LINING	4
C	PLANUM CHAMBER	1*
C-1	BENTONITE/JACKWOOD PLANK	4
C-2	G.I. SHEET FOR LINING	4
D	BENTONITE/JACKWOOD LEG	4
E	HEAT EXCHANGE UNIT (22 GAUGE G.I. SHEET) WITH 2 SMOKE OUTLETS	1
F	500 WATTS ELECTRIC HEATER WITH WOODEN STAND	1
G	PREPARED ALUMINUM TRAY	5
	10 x 90 BOLT AND NUT	4
	WOOD SCREW (3 x 95)	40
	— 00 — (3 x 25)	150
	— 00 — (3 x 10)	750
	AL ANGLE (25x25x1.560)	12
	HINGE 75MM	2
	TOWER BOLT 75MM	1

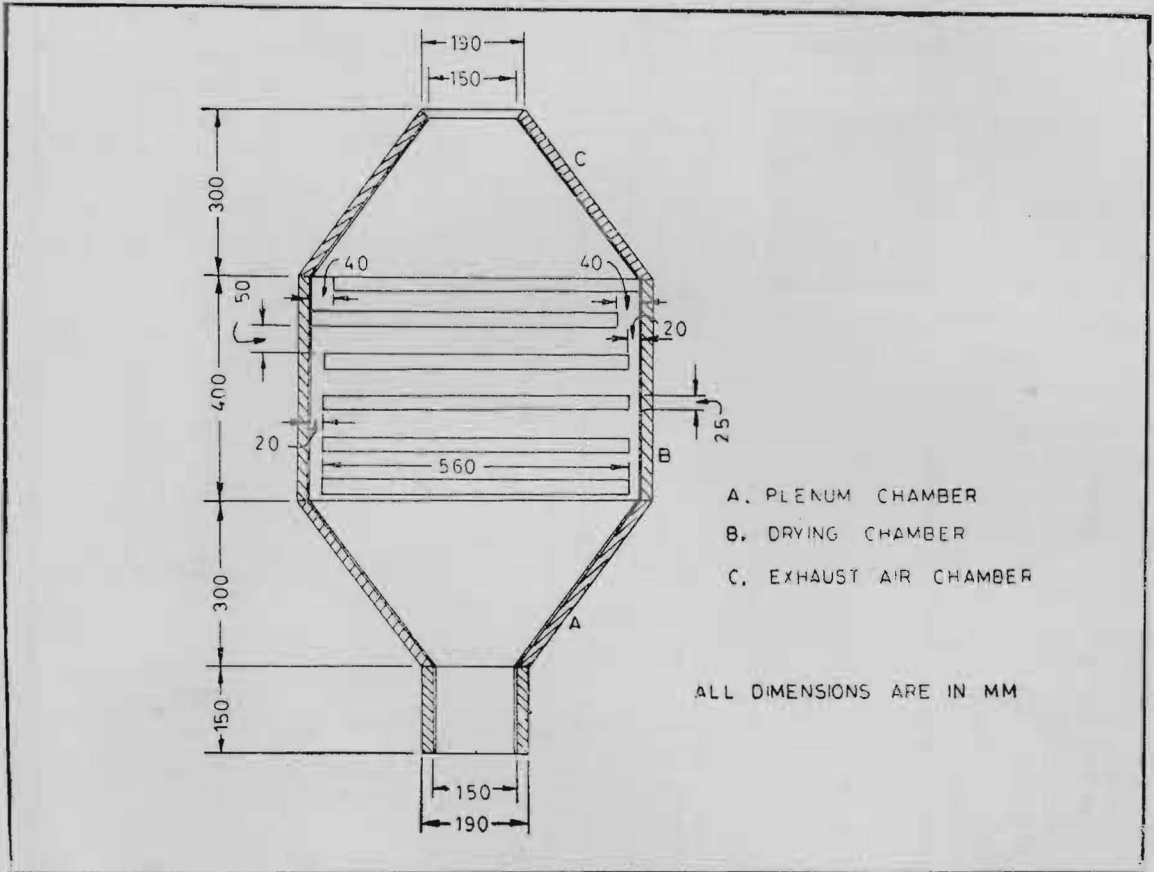


Fig. 2.4. Cross section showing the loading pattern of trays in the drying chamber (side view)

For further information please contact:

Extension Agronomist
CPCRI, Kasaragod-670 124
Kerala